Predicting Miscalibration of Academic Self-Efficacy in First-Year University Undergraduates

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Statement of Sources

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

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Abstract

Academic self-efficacy is traditionally viewed as one of the most important non-intellective determinants of performance outcomes in student populations. However, undergraduate students are particularly prone to "miscalibration", whereby their self-efficacy beliefs do not align with their performance outcomes. Typically, students believe they are capable of higher performance outcomes than those they achieve. However, little is known about what underlies miscalibration of academic self-efficacy miscalibration. The aim in the present study was therefore to explore potential predictors of academic self-efficacy miscalibration in undergraduate university students. The study investigated the influence of a range of characteristics on the likelihood of being overconfident, underconfident, or calibrated. Participants were 85 undergraduate psychology students, who completed a 64-item online questionnaire assessing intrinsic and extrinsic motivation, task value, internal attribution of success, external attribution of failure, previous experience in pre-tertiary psychology, Australian Tertiary Admissions Ranking (ATAR) scores, perfectionistic self-presentation, and sex. Participants were prone to miscalibration overall; though in this sample, most were underconfident. Multinomial logistic regression models provided support for the influence extrinsic and intrinsic motivation and task value, the internal attribution of success, pre-tertiary psychology completion, and ATAR scores. Furthermore, several hypotheses were only partially supported; predictor variables differentiated between students according to their calibration group, but not in the anticipated direction. Students were prone to miscalibration nonetheless, thus indicating that educational interventions that specifically target under-confidence in university undergraduates may be necessary.

Social cognitive theory and self-efficacy

Social cognitive theory (Bandura, 1982) suggests that human behaviour is influenced by the continuous interplay between environmental, behavioural, and personal factors. Increasing attention throughout social-cognitive research has been directed towards personal factors such as self-efficacy, which is believed to have a powerful influence on the way that individuals think, feel, and subsequently behave (Bandura, 2001). Self-efficacy refers to an individual's perceived capability to implement and perform suitable courses of action to reach their goals (Bandura, 1997). In an educational context, academic self-efficacy refers to an individual's perceived capability to implement and execute appropriate behaviours to achieve their academic targets and goals (Zimmerman, Bandura & Martinez-Pons, 1992; Bandura, Barbaranelli, Caprara & Pastorelli, 1996).

Academic self-efficacy has been described as one of the most important non-intellective determinants of educational success because students' perceptions of their competence are said to have a have a powerful influence over the way that they regulate their behaviour (Zimmerman, 1990; Bandura, 2001; Greene, Miller, Crowson, Duke & Akey, 2004). In turn, self-efficacy is believed to have a powerful impact on students' achievement outcomes (Bandura, 1997; Schneider & Preckel, 2017). Academic self-efficacy is particularly important for undergraduate university students who are transitioning into higher education, where they are expected to appropriately evaluate their competencies and regulate their behaviour (Gore, 2006).

Self-efficacy and self-regulation

Students' self-efficacy beliefs influence their task choices and how they self-regulate their behaviour (Kitsantas, Winsler & Huie, 2008). Self-regulation is the ability to actively initiate and appropriately self-direct learning processes to

accomplish specific learning goals (Zimmerman, 2008). Self-regulatory behaviour develops through the triadic interaction between self-observations, self-evaluation, and reactions to performance outcomes (Zimmerman, 1990). Good self-regulators are assumed to appropriately plan, organise, self-evaluate, and structure their study plans and behaviour to optimise their learning and achievement outcomes (Zimmerman, 1990; Wang, Shannon & Ross, 2013). By contrast, poor self-regulators are assumed to insufficiently monitor or organise their work and risk poor achievement outcomes (Zimmerman, 1990; Klassen & Usher, 2010).

Self-regulation is particularly important for students who are in control of their own learning in educational settings, such as university (Gore, 2006). Successful self-regulation is driven by accurate evaluations of which tasks require attention and effort, which are influenced by an individual's perceived level of capability (Hartwig & Dunlosky, 2017). Students with high academic self-efficacy are assumed to exert greater control over the way they self-regulate their behaviour (Klassen & Usher, 2010), are more motivated to learn (Soyer & Kirkkanat, 2018), expend greater effort on their work (Vogel & Human-Vogel, 2016), and show resilience in the face of challenges (Wilcox & Nordstokke, 2019). On the other hand, students with low academic self-efficacy are assumed to believe that they are incapable of reaching their goals and therefore have less incentive to persevere in the face of challenges (Bandura & Schunk, 1981), withdraw effort sooner, and disengage from their studies (Valentine, DuBois & Cooper, 2004; Phan, 2012).

Self-efficacy and academic achievement

Within the educational domain, the social cognitive view of self-efficacy is interpreted to mean that high academic self-efficacy fosters high academic achievement (Usher, 2009). A longstanding finding in social cognitive research is

that self-efficacy is one of the strongest predictors of performance outcomes in student populations (Jackson, 2018). For example, meta analytic studies by Multon, Brown, and Lent (1991) have examined the relationship between self-efficacy beliefs and performance outcomes on achievement tests, course grades and basic skills tasks across primary, high school, and university student populations. Results indicated a moderate positive relationship between self-efficacy and performance outcomes, in which higher self-efficacy was associated with higher achievement. Overall, self-efficacy beliefs accounted for 14% of variance in academic outcomes. Honicke and Broadbent's (2016) systematic review of 59 papers on university students' academic self-efficacy beliefs similarly indicated that academic self-efficacy was correlated with performance outcomes such as examination results, GPA, and course grades. Similarly, Richardson, Abraham and Bond's (2012) meta-analysis examined 42 non-intellective constructs associated with undergraduate students' GPA scores, including performance self-efficacy, which the authors defined as students' specific perceptions of their performance capability. Overall, performance self-efficacy was one of the strongest predictors of GPA.

More specifically, patterns across the literature have indicated that high self-efficacy fosters higher performance amongst undergraduate psychology student samples. For example, McKenzie and Schweitzer (2001) examined the relationship between self-efficacy and academic outcomes in 197 first year undergraduate university students. Results indicated that self-efficacy was positively and significantly related to students' GPA. In the same study, self-efficacy predicted GPA over and above students' university entrance scores alone, although the strength of the relationship between self-efficacy and GPA was weak. In a sample of 243 first-year psychology undergraduates, Kitsantas et al. (2008) also found that high

self-efficacy scores on the MSLQ were moderately and positively related to first-year achievement. Ferla, Valcke and Schuyten (2010) found that in a sample of 512 first year psychology students, students with higher self-efficacy reported obtaining higher GPAs. However, only a weak relationship was observed.

Although the abovementioned research has benefited from the use of meta-analytic techniques that integrate results from multiple studies (Multon et al., 1991; Richardson et al., 2012), as well large samples (Ferla et al., 2010) that maximise statistical power or the ability of the research to find real effects, the relationship between self-efficacy and performance is at best, only moderately correlated with academic performance outcomes (Honicke & Broadbent, 2016).

As such, a considerable amount of variance in students' performance outcomes cannot be explained by self-efficacy beliefs. For example, McKenzie and Schweitzer (2001) indicated that self-efficacy could only account for 8% of the variance in students' grades. Similarly, Ferla et al. (2010) identified that academic self-efficacy could only explain 7.4% of variance in students' grade outcomes. This calls into question whether the relationship between self-efficacy and performance may be more complex than traditionally hypothesised by social cognitive theory.

Miscalibration of self-efficacy and academic performance

Recent research has suggested that one of the reasons that high self-efficacy can only account for a small portion of variance in achievement outcomes is that students' beliefs often misalign or are "miscalibrated" with objective measures of their performance (Vancouver & Kendall, 2006; Honicke & Broadbent, 2016). Rather than endorsing the social cognitive assumption that high self-efficacy fosters high achievement, recent studies have indicated that low achieving students are prone to believing they are capable of higher achievement grades than those they

receive (Lewine & Sommers, 2016), while high achieving students are prone to believe that they are inadequate, despite a clear history of academic success (Hutchins & Rainbolt, 2017). Miscalibrated self-efficacy beliefs have been consistently observed in undergraduate student populations (Gramzow, Elliot, Asher & McGregor, 2003; Talsma, Schüz, Schwarzer & Norris, 2018; Talsma, Schüz & Norris, 2019; Nowell & Alston, 2007; Stinson & Zhao, 2011).

For example, Talsma et al. (2019) indicated that first year psychology undergraduates' self-rated capability to achieve course grade outcomes on written assignments and exams was significantly miscalibrated with their objective performance outcomes. More than two thirds of students' self-efficacy beliefs exceeded their grade outcomes, in which lower achievers had a tendency to be over-confident, while higher achievers were underconfident[1].

Similar patterns of results have been observed in other undergraduate samples. For example, Stinson and Zhao (2011) indicated that 62% of first year business students overestimated their exam scores, while 33% underestimated their scores. Nowell and Alston (2007) similarly indicated that out of the economics students who received a fail grade, 90% expected to pass, to suggest that lower performers were overconfident. Furthermore, research has indicated that biased evaluations of performance capability may predict poor performance specifically, because overconfidence on one occasion predicts poor performance on subsequent tasks (Talsma et al., 2019). Although these studies were correlational and therefore cannot infer that miscalibrated self-efficacy causes poor academic outcomes, they

[1] While debate ensues regarding the labelling of constructs in this area (Williams & Rhodes, 2016; Bong, Cho, Ahn & Kim, 2012; Phan 2012), to explore this debate further is beyond the scope of the present study. For the sake of facilitating interpretation in line with Bandura's (2006) recommendations, the term "confidence" will be used to describe self-efficacy. "Over-confidence" will refer to over-efficaciousness or a positive self-efficacy bias, and "under-confidence" will refer to under-efficaciousness or a negative self-efficacy bias.

suggest that traditional notions of self-efficacy as a self-fulfilling prophecy may be an oversimplification of how self-efficacy and performance are related.

While traditional social-cognitive theory suggests that self-efficacy somewhat higher than objective performance capacity is adaptive because it facilitates greater motivation and persistence (Bandura, 1997), the findings above align with a control theory perspective. By contrast, control theory suggests that overconfidence leads to inappropriate self-regulatory behaviour, which puts students at risk of poor academic outcomes (Vancouver et al., 2001). Control theorists suggest that when students' fail to recognise that their self-efficacy exceeds their objective performance capacity, they are unlikely to appropriately allocate resources (such as spending adequate time studying), which may lead to poor academic outcomes (Vancouver et al., 2001).

For example, research suggests that overconfident students may underestimate the amount of effort that they need to expend to meet their goals (Boekaerts & Rozendaal, 2010; Wüst & Beck, 2018), overlook the need to seek help (Jensen & Moore, 2008), and may lack the relevant skills to organise and complete their work (Moore & Healy, 2008). Overconfident students also tend to fail to monitor their progress (Roelle, Schmidt, Buchau & Berthold, 2017) and stop studying sooner (Vancouver & Kendall, 2006). On the other hand, underconfident students may misallocate resources by overstudying to fill their perceived deficits in knowledge (Maki, Shields, Wheeler, Zacchilli, 2005), and avoid challenging courses that subsequently stunt skill development (Pajares, 2003).

Miscalibrated self-efficacy may therefore have particularly detrimental consequences for performance outcomes in a university setting where self-regulated learning is essential for academic achievement and advancement (Sheldrake, 2016a). Beyond first year outcomes, first year failure is a key contributor to attrition (Scott &

Graal, 2007), which is consistently higher in first year undergraduates, with attrition rates in first-year in Australia up to 20% (Baik, Naylor, Arkoudis & Dabrowski, 2019; Department of Education, 2016). As such, poor academic performance in first-year may have flow on effects that limit educational and vocational career opportunities (Wilcoxson, Cotter & Joy, 2011).

It is therefore important to understand the factors that predict miscalibration in undergraduate students, however it remains unclear which factors predict miscalibrated academic self-efficacy (Ehrlinger, 2016). As such, efforts to correct miscalibration are limited, and students at risk of poor academic outcomes are likely yet to have been identified. It is therefore important to explore these factors in university students to identify students at risk of poor self-regulation and subsequent poor performance.

The present study

The aim of the present study was therefore to explore the student characteristics that predicted calibration of academic self-efficacy in first year psychology students at an Australian university. Participants were categorised as either overconfident (self-efficacy exceeded academic performance), calibrated (self-efficacy was aligned with academic performance) or underconfident (self-efficacy fell short of academic performance). More information and a detailed rationale regarding this study design are provided in the method section. Below, the proposed predictors are outlined. In the absence of a comprehensive existing theoretical model of predictors of miscalibration of self-efficacy, the analyses here are exploratory insofar as hypotheses stipulate a direction of miscalibration (e.g, high scores on a variable are hypothesised to be associated with greater odds of overconfidence), but the comparison category is not identified specifically (i.e., continuing from the

previous example, participants would have greater odds of being overconfident than calibrated *and/or* underconfident).

Attributional biases: Self-enhancement and self-protection

Self-serving attributional biases function to protect and enhance an individual's sense of self-worth (Alike & Sedikides, 2009). Self-enhancement strategies refer to tactics that maintain, maximise and regulate positive views of the self by attributing responsibility for success to internal factors such as natural ability, effort, or self-discipline (Hepper, Gramzow & Sedikides, 2010). By contrast, self-protective strategies help individuals to defend themselves from feeling incompetent or worthless by attributing failure to external forces outside of their control such as bad luck, fate, or unfair evaluation (Larson, 1977; Ransom, Kast & Shelly, 2015). Research has indicated that individuals are particularly inclined to believe that their internal qualities are responsible for their successes, while external forces beyond their control are responsible for their failure (Genc, 2014).

In an academic context, self-serving attributional biases have been associated with biased information processing that lead students to attend to, remember and exaggerate positive feedback, while they disregard, reject or ignore failure (Ehrlinger, Mitchum & Dweck, 2016). Self-enhancing and self-protective attributions are particularly important for students transitioning into first year university who are often faced with unexpected failure, and subsequently seek to find reasons for their poor performance that protect or enhance their self-worth (Perry, Stupinksy, Daniels and Haynes 2008).

For example, research has indicted that internal attributions of success that involve seeking out and remembering positive feedback are associated with higher confidence (Jiang & Kleitman, 2015). Research has also indicated that unsuccessful

students often attribute failure to external forces such as unfair task difficulty or bad luck (Cortes-Suarez, 2008; Perry et al., 2008). Gramzow et al. (2003) found that self-enhancement strategies were associated with overconfident predictions of GPA in college students. Similarly, Bol, Hacker, O'Shea and Allen (2005) indicated that students who attributed their failure to external sources such as task difficulty and luck were more likely to be overconfident in their quiz grades. It was therefore hypothesised that participants with high scores on measures of internal attributions of success and external attributions of failure would be more likely to be overconfident.

Motivational biases: Intrinsic and extrinsic motivation

Goal orientation refers to a students' perception of the reason that they engage in learning tasks (Pintrich et al., 1991). Self-determination theory (Ryan & Deci, 2000) suggests that individuals engage with learning tasks to meet their needs for competence, connection and autonomy. In this view, people are motivated either because they value the activity itself, or because they feel externally coerced to complete it (Ryan & Deci, 2000). Intrinsic goal motivation is characterised by a self-determined internal drive to satisfy curiosity, personal growth, and deep learning associated with a task (Vansteenkiste, Lens & Deci, 2006). By contrast, students who are extrinsically motivated are externally pressured to complete academic tasks as a means to an end, rather than enjoyment or willingness connected to the task itself (Ryan & Deci, 2000; Serin, 2018)[2].

Students who are intrinsically motivated are assumed to have a natural inclination towards maximising their competencies and a willingness to immerse themselves in their learning (Dunn, 2014). When tasks are enjoyable, individuals

[2] While self-determination theory (Ryan & Deci, 2000) suggests that extrinsic motivation comprises varying degrees of autonomy including external regulation, introjection, identification and integration, to explore each subtype of extrinsic motivation is beyond the scope of the present study. For the purpose of the present study, only external regulation will be included.

expend greater effort and persistence in the face difficulties beyond the amount of effort that is required, which accordingly facilitates better self-regulation and higher academic achievement outcomes (Turner, Chandler & Heffer, 2009; Vansteenkiste et al., 2006). Intrinsic motivation is also associated with reduced defensiveness, such that intrinsically motivated students may be more likely to monitor their progress accurately and take constructive feedback on board (Hodgins, 2008). It was therefore hypothesised that participants with high scores on a measure of intrinsic motivation would be more likely to be calibrated.

In contrast to intrinsic motivation, extrinsic motivation has been linked to shallow learning strategies and inappropriate self-regulatory behaviour in student populations (Ryan & Deci, 2000). For example, extrinsic motivation in psychology undergraduates has been associated with superficial engagement and surface level learning strategies such as rote learning, memorising, or re-reading notes (Walker, Greene & Mansell, 2006). Meta analyses have also indicated that extrinsic motivation is not a significant predictor of GPA (Richardson et al., 2012), and has negative relationship with reading achievement (Becker, McElvany & Kortenbruck, 2010). However, positive relationships between extrinsic motivation and self-efficacy has been observed in university undergraduates (Zhang, Cao, Shen & Qian, 2019; Ommering, van Blankenstein, Waajer & Dekker, 2018), to suggest that extrinsically motivated students may be prone to believing that they are capable of higher achievement outcomes than they receive. As such, it was hypothesised that participants with high scores on a measure of extrinsic motivation would be more likely to be overconfident.

Task Value

While goal orientation concerns the reason that students engage with academic tasks, task value concerns students' perception of how important, interesting or valuable their academic tasks are (Pintrich, 1991; Liem, Lau & Nie, 2007). The expectancy-value theory of motivation (Atkinson, 1957; Wigfield & Eccles, 2000) suggests that persistence and performance on academic tasks is a result of how well students believe they will perform (expectancy), and how much they value the activity (value). Students who expect to perform well and perceive academic tasks to be interesting or relevant to their future academic goals are therefore assumed to expend greater effort on tasks and persist in the face of challenges compared to when they deem themselves incapable and believe tasks are useless or unimportant (Husman, Derryberry, Crowson & Lomax, 2004).

Although task value has been hypothesised to foster greater engagement with learning material and subsequently appropriate self-regulatory behaviour (Neuville Frenay & Bourgeois, 2007), recent research has indicated that higher perceived task value does not align with higher performance (Sheldrake, Mujtaba & Reiss, 2014). For example, research has indicated that overconfident students have ascribed greater interest and value in maths subjects compared with those who were underconfident (Gonida & Leondari, 2011). Sheldrake (2016a) later indicated that undergraduate students with higher task value or perceived utility scores overestimated their science grades. It was therefore be hypothesised that participants with high scores on a measure of task value would be more likely to be overconfident.

Cognitive biases: ATAR

Cognitive biases refer to systematic errors in thinking that impair an individual's ability to make accurate judgements about their competence (Barenberg

& Dutke, 2013). Research has indicated that students with low cognitive ability are particularly prone to biases in their judgements because they not only lack the necessary skills required for academic achievement, but also lack the insight that is required to recognise their deficits, thus rendering them "unskilled and unaware of it" (Kruger & Dunning, 1999; Bol et al., 2005). Poor performers are consequently faced with a "double curse" that restricts them from having the skills to succeed, or the necessary insight to accurately assess their incompetency (Ehrlinger, Banner, Johnson, Dunning & Kruger, 2008).

Problematically, metacognitive deficiencies may lead some students to develop inflated self-efficacy beliefs that misalign with objective measures of poor performance (Hodges, Regehr & Martin, 2001). For example, Kruger and Dunning (1999) indicated that students who were performing in the bottom quartile of their peers on measures of grammar and logical reasoning believed that they were performing in the 60th percentile. Ehrlinger et al. (2008) later indicated that students in the 49th percentile on an undergraduate psychology exam thought that they were performing in the 72nd percentile. Bol et al. (2005) also indicated that lower achieving university students tended to be overconfident in their predictions for their quiz performance by an average of 8 percentage points.

On the other hand, the same studies have indicated that high achievers were underconfident. For example, students in the top 25% of their class believed they were only performing in the 75th percentile (Kruger & Dunning, 1999). Similarly, Ehrlinger et al. (2008) indicated that high achieving students in the 87th percentile of their class believed they were in the 73rd percentile. Bol et al. (2005) also found that while higher achieving students were more accurate in predicting their exam scores, they were underconfident in their scores by an average of 1.16 percentage points.

Both incompetence and high competence may therefore undermine self-insight (Dunning et al., 2003) and the accuracy of self-efficacy. This effect will be extended to the present study, using students' Australian Tertiary Admissions Ranking[2] (ATAR) score as an objective and specific index of performance capability in line with research that has used similar measures such as high school SAT scores as a measure of cognitive ability (Richardson et al., 2012). Research has also indicated that students with lower ATAR scores (below 70) receive lower university grades than their peers with high ATARs (Baik et al., 2019). In the present study, it was therefore hypothesised that students with lower ATAR scores would be more likely to be overconfident.

Mastery experience: pre-tertiary psychology

Self-efficacy develops through four key sources, from which individuals interpret and integrate information to inform their personal judgements of their capability to accomplish tasks (Webb-Williams, 2018). Sources of self-efficacy include mastery experience (previous successes and failures), vicarious experience (the observation of others' success and failure), verbal persuasion (verbal encouragement from others), and physiological and emotional states (feelings experienced while performing behaviours) (Butz & Usher, 2015). Research has consistently indicated that mastery experience has been described as the most powerful source of self-efficacy beliefs across student samples because it provides the most authentic evidence of personal capability through direct experience (Anderson & Betz, 2001; Fong & Krause, 2014; Shipherd, 2018).

[2] ATAR is a number between 0.00 and 99.95 that indicates a students' academic performance position relative to all other students in their age group in their state (Joyce, Hine and Anderton, 2017). For example, an ATAR of 70 indicates a student performed better than 70% of people in their age group.

More specifically, previous success in similar domains is assumed to increase confidence for performance on similar tasks (Usher & Pajares, 2008). For example, research has indicated that university maths students cite their high school maths grades as key sources of their confidence for maths performance in higher education (Matsui, Matsui & Ohnishi, 1990). Despite high self-efficacy however, students with mastery in an applicable domain may lack the capacity to perform well specifically in university courses, which often require advanced and specialised analytic and critical thinking skills (Catteral, Davis & Yang, 2013). In the present study, it was therefore hypothesised that students who completed pre-tertiary psychology would be more likely to be overconfident.

Perfectionistic self-presentation

Perfectionistic self-presentation refers to a maladaptive and self-defeating impression management strategy characterised by self-imposed pressure to present a flawless self-image (perfectionistic self-promotion) while hiding imperfections or mistakes from others (non-disclosure and non-display of imperfection) (Hewitt & Flett, 2005). Research has indicated that perfectionistic self-presentation is associated with negative self-views, (Hewitt et al., 2003), excessive concern over mistakes, and self-consciousness (Hewitt et al., 2003; Nepon, Flett & Hewitt, 2016), because self-imposed pressure to present an unrealistically high standard to others fosters dissatisfaction with imperfect performances (Stoeber, 2015).

In particular, research has indicated that perfectionistic traits are associated with low self-esteem (Hewitt et al., 2003), low confidence (Frost & Henderson, 1991) and low self-efficacy (Hart, Gilner, Handal & Gfeller, 1997). Accordingly, it was therefore hypothesised that participants with high scores on a measure of perfectionistic self-presentation would be more likely to be underconfident.

Sex

Research has indicated that males and females differ in their capacity to accurately assess their competence (Huang, 2013; Pajares, 2005). Patterns across the literature suggest that males are more likely to have higher self-efficacy (Huang, 2013), and often believe that they are capable of achieving performance outcomes that are higher than the those they actually receive (Moore & Dev, 2017; Sheldrake et al., 2014). Furthermore, research has indicated that male students are more likely to be overconfident in their maths and language outcomes compared with females (Gonida & Leondari, 2011). It was therefore hypothesised that males would be more likely to be overconfident compared to females.

Method

Participants

The original sample comprised 184 participants. Of these, 98 cases could not be included because the survey was not completed (and consent was only provided at the end of the survey). One additional extreme outlier case was deleted (described in detail in the results section). The final sample comprised 85 university undergraduate students (*M*age=24.55, *SD* =9.83, range=17 – 64). The majority of participants (94%) identified with an Australian cultural background. Participants were recruited via advertisements displayed during their first-year psychology unit lectures where they were provided with a direct link to access the survey online. Ethical approval was provided by the Human Research Ethics Committee (#H0017955) (see Appendix C).

Materials and Procedure

Participants responded to a 64-item online questionnaire on Lime survey, which took approximately 30 minutes to complete (see Appendix B for demographic and scale items, and see below for outcome variable items). Before commencing the

questionnaire, participants were provided with an online information sheet that outlined the aims of the study, ethical considerations, and the investigators' contact information (Appendix A). Participants were informed that submission of the questionnaire would imply informed consent to participate. Due to the restraints of the Lime survey software, all participants answered all questions in the same order. Prior to inviting participants to respond, the questionnaire was piloted on a convenience sample of 10 people to assess the amount of time required for completion and to check for clarity.

Design

A multinomial logistic regression design was used to predict group membership (-1: underconfident, 0: calibrated, 1: overconfident) from the predictor variables outlined below. While trichotimising the outcome variable results in a loss of variance, there are several reasons for taking this approach. Firstly, this approach is consistent with recent research which considers calibration bias scores as reflective of meaningful diagnostic categories (e.g., Gonida & Leondari, 2011; Kolovelonis & Goudas, in press; Sheldrake et al., 2016; Talsma et al., 2019). Secondly, calibration bias is not monotonic in terms of accuracy; that is, as calibration scores increase from less than one towards zero, participants are becoming more accurate in their calibration, while as scores increase to zero to more than one, participants are becoming less accurate in their calibration. Therefore, it was not expected that linear relationships would be observed between the predictors and the full range of calibration bias scores, rendering methods with this assumption inappropriate (Stankov, Lee, Luo & Hogan, 2012). As an example, higher intrinsic motivation was expected to be associated with better calibration, that is, scores closer to zero: the middle of the calibration bias scale. Thirdly, this approach has been suggested to

attenuate the lack of reliability associated with difference scores (e.g., Mersman & Donaldson, 2000; Stankov et al., 2012). Finally, categorisation facilitates a practically meaningful differentiation of students who are at risk of poor performance (e.g., Talsma et al., 2019), which can be clearly interpreted by educators, students and policy makers for whom the results of the present study will be useful in practical contexts. With the above points in mind, it was determined that a qualitatively meaningful categorisation of calibration bias scores was the most appropriate approach in the present case (see the description of the outcome measure, below, for further details).

Measures

Outcome variable: self-efficacy (overconfident, calibrated, underconfident)

Various approaches have been used in the literature to measure calibration in educational settings (see Hacker, Bol & Keener, 2008, for review). One of the most straightforward and longstanding methods involves the use of signed difference scores, in which the criterion score (e.g., grade) is subtracted from the self-score (e.g., self-efficacy) (e.g., Hacker, Bol, Horgan & Rakow, 2000; Kolovelonis & Goudas, in press; Sheldrake et al., 2014). This constitutes a measure of absolute bias, in which overconfident participants will have a positive calibration score (because self-efficacy exceeds performance) and underconfident students will have a negative calibration score (because self-efficacy falls short of performance). Absolute bias refers to how closely subjective judgements of performance correspond with objective performance outcomes, with grade outcomes providing an authentic measure of bias in a practical setting (Valdez, 2013). In order to calculate calibration scores for participants, grades were subtracted from grade self-efficacy scores.

For grade self-efficacy, participants rated their confidence in their ability to achieve particular unit grades. Following recommendations for designing self-efficacy scales (Bandura, 2006), outcomes were presented in increasing levels of difficulty (5% increments, from 40% to 90%; e.g., "*I am confident in my ability to achieve a grade of at least 55% in this unit"*). Participants were asked to select "yes" if they were confident in their ability to achieve the outcome, or "no" if they were not confident. Grade self-efficacy represented the highest grade for which they provided a "yes" response. Participants end of semester grades, on a scale from 0 – 100, were obtained from institutional records. Grades were accessed with participants' informed consent by the chief investigator (see Appendix A). For interpretation, note that the University of Tasmania's standard grade bands are as follows: failure (0-49%), pass (50-59%), credit (60-69%), distinction (70-79%), high distinction (80-100%).

Although there is no established theoretical rationale for cut-offs for categorising calibration, overconfidence, or under-confidence, researchers have suggested that scores that fall within a 10% range of perfect accuracy are calibrated, while those outside of this range are biased (Stankov & Lee, 2014; Talsma et al., 2019). This provides a "window" for accurate calibration, rather than requiring calibration to be an exact match between self-efficacy and performance.

Participants were therefore categorised as overconfident if their self-efficacy score exceeded their unit mark by half a grade band or more, or 5% of the scale range. Participants were categorised as underconfident if their self-efficacy score fell short of their unit mark by half a grade band or more. Students were categorised in accordance with the recommendations from previous research to allow the results of the present study to be comparable across studies.

Predictor variables

Participants' academic ability was measured using their Australian Tertiary Admission Rank (ATAR) from their pre-tertiary studies, which is a number between 0.00 and 99.95. Higher ATARs indicated higher academic ability. Participants were asked to report their ATAR to two decimal places.

Intrinsic motivation, extrinsic motivation, and task value were measured using the *Motivated Strategies for Learning Questionnaire* (MSLQ) (Pintrich, 1991). All MSLQ scales use a 7-point Likert scale (1*"not at all true of me -7 very true of me"*) and higher scores indicate higher levels of the relevant construct. For intrinsic motivation, participants responded to four statements (e.g., *"In a class like this, I prefer course material that really challenges me so I can learn new things"*). Concurrent validity is evidenced by positive correlations with measures of academic self-efficacy (Bonanomi, Olivari, Mascheroni, Gatti & Confalonieri, 2018) and significant (although small) correlations in the expected directions with average course grade outcomes (r=.29) (Garcia & Pintrich, 1996). Discriminant validity is also evidenced by negative correlations with measures of test anxiety (r=-.15).

For extrinsic motivation, participants responded to four statements (e.g., "*Getting a good grade in this class is the most satisfying thing for me right now")*. The scale's predictive validity has been evidenced by its significant correlations in the expected direction with student grade outcomes (r = .41) and measures of test anxiety (r =.23) (Pintrich, Smith, Garcia & McKeachie, 1993). Discriminant validity has been evidenced by psychometric studies that indicate weak and negative correlations with the intrinsic motivation subscale (Nielsen, 2018).

For task value, participants responded to six statements (e.g., "*I think the course material in this class is useful for me to learn"*). Concurrent validity is

evidenced by significant correlations in the expected directions with measures of intrinsic goal motivation and self-efficacy (Pintrich et al., 1993). Discriminant validity is demonstrated by negative correlations with test anxiety (r = -.14). The subscale's predictive validity has also been demonstrated by significant correlations in the expected direction for final course grade outcomes in college student samples (r =.41) (Pintrich et al., 1993).

Perfectionistic self-presentation was measured with the *Perfectionistic Self-presentation Scale* (Hewitt et al., 2003), which contains 27 statements (e.g., "*I strive to look perfect to others*"). Statements were rated on a 7-point Likert scale from 1 *"disagree strongly*" to 7 "*agree strongly*". Concurrent validity has been demonstrated by high positive correlations with measures of perfectionism including Hewitt & Flett's (1990) Multidimensional Perfectionism Scale, as well as public self-consciousness, fear of negative evaluation, and feeling like an impostor (Ferrari & Thompson, 2006; Hewitt et al., 2003). Test-retest coefficients are good, ranging between .74 and .83. over a three-week period (Hewitt et al., 2003). Content validity has been demonstrated by confirmatory factor analyses that indicate the scale measures three separate factors (Zolotareva, 2018).

Internal attribution of success and external attribution of failure were measured using the *Self-Enhancement and Self-Protection Scale* (Hepper, Gramzow & Sedikides, 2010). Both scales are rated on a 6-point Likert scale, from 1 (not at all characteristic of me) to 6 (very characteristic of me) and higher scores indicate higher levels of the relevant construct. For internal attribution of success, participants responded to three statements, e.g., "*When you achieve success or really good grades, thinking it was due to your ability"*. Concurrent validity has been

demonstrated by anticipated positive correlations with self-esteem and narcissism (Hepper et al., 2010).

For external attribution of failure, participants responded to three statements e.g., "*When you do poorly at something or get bad grades, thinking it was due to bad luck".* Discriminant validity has been demonstrated by weak correlations with measures of self-esteem, and concurrent validity is evidenced by positive correlations with the avoidance of feared outcomes or failures (Hepper et al., 2010).

Sex (male/female) and pre-tertiary psychology completion (yes/no) were measured with single items.

Control variable

Higher self-efficacy scores would allow less opportunity for grades to exceed self-efficacy (thus increasing the likelihood of over-confidence), and lower self-efficacy would have less opportunity for grades to fall short of self-efficacy (increasing the likelihood of under-confidence). As such, there was potential for ceiling and floor effects. For this reason, it was necessary to control for grade self-efficacy, but it was not possible to include grade self-efficacy itself in the model because this variable was used in calculating the outcome variable. Therefore, a measure analogous to grade self-efficacy was used, in which participants indicated the grade they were aiming for in their psychology unit on a scale ranging from 0 to 100% (grade aim).

Cronbach's alpha coefficients indicated that participant responses to scale items were internally consistent in the present study (see Table 1).

Table 1

Internal Consistency of Questionnaires: *Original Validation and Current Study*

Scale	Author	Original Cronbach's	Current Cronbach's
MSLQ: Intrinsic motivation	Pintrich (1991)	.74	.76
MSLQ: Extrinsic Motivation		.62	.78
MSLQ: Task value		.90	.91
SESP: Positivity Embracement	Hepper et al. (2010)	.78	.64
SESP: Defensiveness		.86	.68
Perfectionistic self-presentation	Hewitt et al. (2003)	.84	.88

Note. MSLQ = Motivated Strategies for Learning Questionnaire; SESP = Self Enhancement and Self Protection Scale

Results

Preliminary analyses

Preliminary analyses were conducted to check that the assumptions of multinomial logistic regression were met. Visual inspection of normality plots indicated one extreme outlier (see supplementary material). It was established that this single participant received a grade of 2, which had flow-on effects to the outcome variable and this case was deleted. There was no evidence of multicollinearity, evidenced by VIF values >0.1, and Tolerance values (10) (see supplementary material for complete collinearity diagnostics; see Table 2 for correlations between the predictor variables of less than 0.8). The assumption of linearity of the logit was met, in which all continuous predictor variables were linearly related to the log of the outcome variable and all of the interactions between scale scores and the logit had significance values greater than 0.5 (see supplementary material). Statistical analysis indicated the presence of cell sizes with zero frequencies, in which 66.7% (104 cells) of all possible combinations of variables did not have any data. As the goodness of fit tests for the model assume that there are no empty cells, these test results should be interpreted with caution; though it is noted that any analysis with multiple continuous predictors is likely to violate this assumption.

Table 2.

Pearson Correlations for Scale Variables

	Grade SE	Grade	Sex	PTP	IntMot	ExtMot	Task	IntAtt	ExtAtt	Perf	ATAR
Grade SE	-	-	-	-	-	-	-	-	-	-	-
Grade	.380**	-	-	-	-	-	-	-	-	-	-
Sex	.185	-.187	-	-	-	-	-	-	-	-	-
PTP	.121	-.116	.068	-	-	-	-	-	-	-	-
Intrinsic	.104	.065	.029	.169	-	-	-	-	-	-	-
Extrinsic	.017	-.049	-.164	-.040	.184	-	-	-	-	-	-
Task Value	-.049	.014	-.130	.272*	.419**	.125	-	-	-	-	-
Internal	-.105	-.089	-.269*	-.051	.057	.404**	.066	-	-	-	-
External	-.120	-.313**	.177	.027	.022	.178	-.192	.192	-	-	-
Perfectionism	-.023	-.152	-.220	.066	.037	.437**	.017	.426**	.325**	-	-
ATAR	.390**	.444	-.285	-.012	.174	.148	-.184	.129	.023	-.059	-

*= Correlation is significant at the 0.05 level.
**= Correlation is significant at the 0.01 level.
Note. Intrinsic/IntMot = intrinsic motivation; Extrinsic/ExtMot= extrinsic motivation; Task = Task value; Internal/IntAtt = Internal attribution of success; External/ExtAtt = External attribution of failure

Main results

Descriptive statistics for continuous predictors are shown in Table 3. There were 35 students (41%) who had completed a pre-tertiary psychology unit. 60 participants (71%) were female. Other cohort details are provided in the participants section of the method.

Table 3

Descriptive Statistics: Continuous Scale Variables

	M	*SD*	95% CI lower, upper
Grade self-efficacy	70.38	9.43	67.76, 73.01
Grade	72.26	*9.89*	69.51, 75.02
Intrinsic motivation	17.92	4.56	16.65, 19.19
Extrinsic motivation	19.98	5.43	18.46, 21.49
Task value	28.21	8.31	25.89, 30.52
Internal attribution of success	11.50	2.72	10.74, 12.25
External attribution of failure	6.76	2.89	5.96, 7.57
Perfectionistic self-presentation	110.03	29.37	101.86, 118.21
ATAR	82.62	12.34	79.18, 86.06

Logistic Regression Analyses

A multinomial logistic regression was conducted to predict group membership (-1: underconfident, 0: calibrated, 1: overconfident); given the exploratory nature of the study, this was conducted using backward elimination with the removal criterion based on likelihood ratios set at 0.05.

The final model explained a significant amount of variance in the data, $\chi_2(16) = 51.63$, $p<.001$, Nagelkerle pseudo $R_2 = .71$, and was a good fit to the data, Pearson $\chi_2(86) = 76.84$, $p = .74$. Using the model, 78.8% of cases were correctly classified. Compared to having no model, in which every case would be classified as underconfident (as this group had the highest frequency at 48.1%), the model correctly classified an additional 30.7% of cases. Below are outlined the specific effects of individual predictor variables; owing to space constraints, effects which were not hypothesised/significant are not reported in full and details are available in the supplementary material.

Sex and external attribution of failure were not identified significant predictors and were not included in the final model because they did not significantly differentiate between underconfident, overconfident, and calibrated participants.

Pre-tertiary psychology

Participants who had completed a pre-tertiary psychology unit were significantly more likely to be underconfident than overconfident, $b = 4.69$, Wald $\chi_2(1) = 8.36$, $p = .004$. For participants who had completed a pre-tertiary psychology unit, the odds of being underconfident compared to overconfident increased by a factor of 109.52.

Participants who had completed a pre-tertiary psychology unit were also significantly more likely to be underconfident than calibrated, $b = -3.46$, Wald $\chi_2(1) = 6.98$, $p = .008$. For participants who had completed a pre-tertiary psychology unit, the odds of being underconfident compared to calibrated increased by a factor of 31.87 (OR=31.87). Pre-tertiary psychology completion did not differentiate between calibrated and overconfident participants.

Extrinsic motivation

Participants were significantly more likely to be underconfident than overconfident as extrinsic motivation increased, b = .32, Wald $\chi_2(1)$ = 5.20, p = .023. For each unit that extrinsic motivation increased, the odds of being underconfident compared to overconfident increased by a factor of 37% (OR=1.37). Extrinsic motivation scores did not differentiate between calibrated and under/overconfident participants.

Intrinsic motivation

Participants were significantly more likely to be calibrated as their intrinsic motivation scores increased, as opposed to being underconfident, b=.415, Wald $\chi_2(1)$ = 4.01, p = .045. For each unit that intrinsic motivation scores increased, the odds of being calibrated compared to underconfident increased by 51% (OR = 1.51). Intrinsic motivation scores did not differentiate between under and overconfident participants, or between calibrated and overconfident participants.

Task value

Higher task value scores were associated with a greater likelihood of being underconfident, compared to overconfident, b = .21, Wald $\chi_2(1)$ = 4.32, p=.037. For each unit increase in task value, the odds of being underconfident compared to overconfident increased by 24% (OR=1.24). Task value scores did not differentiate between calibrated and under/overconfident participants.

Internal attribution of success

Participants were significantly more likely to be overconfident than underconfident as their internal attribution of success scores increased, b = -.971, Wald $\chi_2(1)$ = 5.43, p = .020. For each unit increase in internal attribution of success, the odds of being underconfident compared to overconfident decreased by 63%

(OR=.37). Participants were also significantly more likely to be calibrated than underconfident as their internal attribution of success scores increased, b = 1.22, $\chi_2(1)$ =7.28, p = .007. For each unit intrinsic motivation increased, the odds of being calibrated compared to underconfident increased by a factor of 3.40. Internal attribution of success did not differentiate between overconfident and calibrated participants.

ATAR

Participants were significantly more likely to be underconfident than overconfident as their ATAR scores increased, b = .289, Wald $\chi_2(1)$ = 10.68, p=.001. For each unit increase in ATAR, the odds of being underconfident compared to overconfident increased by 33% (OR=1.33). Participants were also more likely to be underconfident than calibrated as their ATAR score increased, b=-.20, Wald $\chi_2(1)$ = 6.49, p=.011. For each unit that ATAR increased, the odds of being calibrated compared to underconfident decreased by a factor of 19% (OR=.81). ATAR scores did not differentiate between calibrated and overconfident participants.

Perfectionistic self-presentation

Participants were significantly more likely to be underconfident as their perfectionistic self-presentation scores increased, when compared to being calibrated, b=-.067, Wald $\chi_2(1)$ = 6.11, p = 0.13. For each unit that perfectionistic self-presentation scores increased, the odds of being calibrated compared to underconfident decreased by 7% (OR=.93). Perfectionistic self-presentation did not distinguish between under and overconfident students, or between overconfident and calibrated participants.

Post-hoc analysis: ATAR

The total sample comprised 85 participants. However, data was missing for 33 cases (38.82%) of ATAR scores. Multiple imputation was therefore conducted. In accordance with Graham, Olchowski, and Gilreath's (2007) recommendations, 20 imputations were completed.

The final model obtained from the multinomial logistic regression analysis above was tested across the 20 imputed data sets. Results indicated that model fit was consistently good (*ps*<.001 - .009). The pooled analysis led to similar conclusions as the original analysis, with all predictors significant and in the same direction as the original model, aside from extrinsic motivation which was in the same direction but did not reach statistical significance (*p*=.09). This suggested that the original model was reasonably robust. Further consideration of the limitations associated with these procedures is provided in the discussion section below.

Post-hoc analysis: Pre-tertiary psychology

Given the magnitude of the effect for pre-tertiary psychology (OR=109.52), a 2 x 2 mixed factorial Analysis of Variance (ANOVA) was conducted to explore differences between participants who had completed pre-tertiary psychology (PTP) and those who had not completed PTP (between groups factor) in terms of their self-efficacy ratings and their actual grades (within groups factor).

The key effect of interest in this analysis was the interaction between PTP and score, though this was not significant, $F(1, 83) = 3.89$, $p=.052$. This result was approaching significance, which indicated that the effect of PTP completion differed across grade and self-efficacy (see Figure 1). As such, follow up *t*-tests using a Bonferroni adjusted alpha level of 0.125 (0.5/4) were conducted to explore these differences.

Paired samples t-tests indicated that participants who had completed PTP achieved significantly higher grades than their self-efficacy scores, $t(34) = -3.15$, $p=.003$, 95% CI[-9.54, -2.05]. Comparatively, there was not a significant difference between grades and self-efficacy for participants who had not completed PTP, $t(49) = -.88$, $p=.38$, 95% CI[-4.13, 1.61] (see Figure 1). Independent samples t-tests were also not significant (see Table 4).

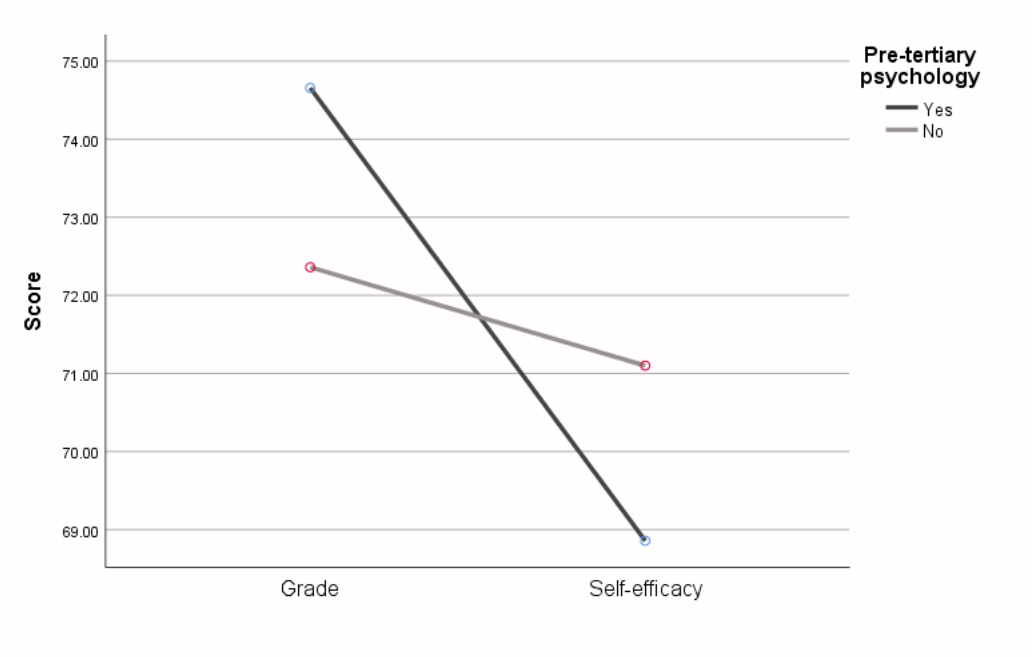

Figure 1. Interaction between pre-tertiary psychology and score

Table 4

Independent Samples t-test for Grade and Self-Efficacy

	t	df	*p*	95% CI Lower, Upper
Grade	1.06	83	.292	-2.01, 6.60
Grade SE	-1.10	83	.272	-6.27, 1.78

Discussion

The aim of the present study was to explore the student characteristics that predicted miscalibration of self-efficacy (overconfidence, under-confidence and calibration) in undergraduate university students. Results indicated that participants were prone to miscalibration, with under-confidence being more common than overconfidence. Multinomial logistic regression models provided support for the influence of motivational biases including extrinsic and intrinsic motivation and task value, as well as attributional biases including the internal attribution of success. Cognitive bias was evident in the prediction of calibration by ATAR scores, while mastery experience, measured as pre-tertiary psychology completion, also predicted calibration group. However, several hypotheses were only partially supported; predictor variables differentiated between students according to their calibration group, but not in the anticipated direction. Much of the discussion that follows explores the potential reasons for this. In interpreting the present findings, several methodological limitations are noted (described in detail in the limitations section below), and as such, the results should be interpreted with caution.

Mastery experiences: Pre-tertiary psychology

The hypothesis that participants who had completed pre-tertiary psychology would be more likely to be overconfident was not supported. While pre-tertiary psychology (PTP) was a significant predictor in the model, contrary to expectations, the results indicated that participants who had completed PTP were more likely to be underconfident than either calibrated or overconfident. When comparing underconfident and overconfident groups, this predictor showed the largest effect size out of all of the predictor variables in the final model (OR=109.52). This finding was not consistent with literature that suggested relevant academic experience is

associated with higher confidence (Lin et al., 2017), and was inconsistent with the traditional social-cognitive assumption that mastery experience in an applicable domain fosters higher self-efficacy (Bandura, 1997; Fong & Krause, 2014).

Post-hoc exploration indicated that for students who had not completed PTP, grades were not significantly different to self-efficacy scores. By contrast, students who had completed PTP received significantly higher grades than the outcomes they believed that they were capable of. This difference indicated that the effect of having completed PTP on predicting under-confidence is potentially partly explained by the tendency in this group to score higher grades but have lower self-efficacy, resulting in pre-tertiary psychology completion being associated with poorer calibration.

A potential explanation for this result may be that is that students' experience of pre-tertiary psychology leads to expectations about the difficulty of their first-year studies that misalign with the realities of university (Chen, 2003). Prat-Sala and Redford (2010) suggest that in the absence of experiences in higher education, undergraduates' expectations about their first semester of study are informed by their experiences in similar domains (such as pre-tertiary units). Anecdotally, it has been suggested that the pre-tertiary psychology curriculum in Tasmania is both broad and challenging. Thus, students who had completed PTP may have expected extreme difficulty in their first semester that did not eventuate, resulting in under-confidence.

Alternatively, these results may reflect the hard-easy effect (Lichtenstein & Fischhoff, 1977). The hard-easy effect refers to a cognitive bias that leads students to feel overconfident about the probability of succeeding at tasks that they perceive to be hard, while they tend to feel underconfident about tasks that they perceive to be easy (Hartwig & Dunlosky, 2017). This would suggest, somewhat counterintuitively, that the participants who had completed pre-tertiary psychology may have assumed

that their first-year studies would be easy, based on their greater domain-relevant experience, thus leading them to be more likely to be underconfident as per the hard-easy effect. While this effect has been observed for item-level judgements (Nietfeld, Cao & Osborne, 2006), as well as judgements about categories of learning (Hartwig & Dunlosky, 2017), the results in this study suggest that this effect may also apply to global judgements of self-efficacy. However, the present study did not measure the scope, breadth, or perceived difficulty of PTP and first year psychology courses, thus this conclusion is speculative and warrants further exploration in future research.

Cognitive biases: ATAR

The hypothesis that students with lower ATARs would be more likely to be overconfident was supported. Participants with lower ATARs were significantly more likely to be overconfident, while participants with higher ATARs were significantly more likely to be underconfident than overconfident or calibrated. This result was consistent with research that indicated poor performing university undergraduates believed that they were performing at a standard beyond their objective grades (Ehrlinger et al., 2008), while higher performers are prone to underestimating their achievements (Dunning & Kruger, 1999).

This result was consistent with the Dunning-Kruger effect, in which students who lacked academic skill (reflected by lower ATAR scores) simultaneously lacked the appropriate insight to identify their incompetency (reflected by their overconfidence in their grades) (Kruger & Dunning, 1999). The results in the present study also aligned with Kruger and Dunning's (1999) contention that top performers underestimate their achievement. In line with the Dunning-Kruger effect, a potential explanation for this result is that high achievers who perceive academic tasks to be

easy assume their peers are performing at a similar or superior standard, thus rendering their own performance unremarkable (Ehrlinger et al., 2008).

Although this result was consistent with empirical theory, inspection of mean ATAR scores indicated a truncated range. Specifically, students who were categorised as overconfident and deemed "unskilled and unaware" had an average ATAR of 81.58, while those categorised as underconfident had a mean ATAR of 83.41. As such, there was limited variability in the data. However, this is likely to have been due to missing data in the sample, for which 33 participants did not report their ATAR score[3]. This data may have been missing in systematic ways (see limitations section for further discussion of this point). For example, students with extremely low ATARs may have chosen not to report them, thus limiting the range of potential scores. However, a statistically significant effect was still apparent. It is therefore likely that greater variability in ATAR scores would have indicated a larger "unskilled and unaware" effect. As such, this result warrants further exploration with a larger sample, which will be explored in greater detail in future directions sections.

Internal attribution of success and external attribution of failure

The hypothesis that students with high internal attributions of success scores were more likely to be overconfident was supported. Participants with high internal attribution of success scores were significantly more likely to be overconfident than underconfident. This result is consistent with research from Gramzow et al. (2003) that indicated self-enhancement motivational styles were associated with exaggerated self-reports of GPA in university students. This result is also consistent with Jiang and Kleitman's (2015) findings that indicated self-enhancement strategies, such as positivity embracement, were positively associated with confidence. Based on this

[3] The limitations associated with missing data are discussed in detail in the limitations section below.

finding, it could be argued that self-enhancement strategies that attain, maximise and maintain positive views of the self may be at the expense of accurate self-assessments (Hepper et al., 2010). A potential explanation for this result may be that students' early learning experiences were tailored to build and maintain their self-esteem in accordance with educational policies that advocated for an emphasis on positive feedback, while minimising constructive criticism (Burnett, 2001). Consequently, students with higher scores on internal attributions of success may have been more likely to overestimate their grades due to attentional biases that preserved their self-worth at the expense of recognising their shortcomings.

However, results also indicated that participants with higher internal attribution of success scores were more likely to be calibrated than overconfident. This result, while not anticipated, is consistent with Jiang and Kleitman's (2015) finding that self-enhancement was indirectly related to greater calibration accuracy. In contrast to the above finding that internal attribution of success predicted overconfidence, the finding that it also predicts calibration suggests that making internal attributions of success may facilitate greater accuracy of self-efficacy for some students. Of note however, is that participants in this sample had relatively high ATAR scores. As such, for this particular sample, it may be that high internal attributions of success scores may have reflected accurate monitoring or feedback, rather than an attempt to enhance self-esteem.

Contrary to expectations, external attribution of failure was not included in the final model as it did not significantly differentiate between underconfident, overconfident, and calibrated students. Hepper et al. (2010) have suggested that the similarities between internal attribution of success and the external attribution of failure make them difficult to empirically tease apart. As such, the shared variance

between external attribution of failure (self-protective strategy) and internal attributions of success (self-enhancement strategy) may have meant that external attributions of failure did not add anything specific to the results beyond internal attributions of success, thus excluding it from the final model.

Intrinsic and extrinsic motivation

The hypothesis that participants with high scores on extrinsic motivation would be more likely to be overconfident was not supported. Instead, students with higher scores on extrinsic motivation were more likely to be underconfident. This result was inconsistent with literature that indicated that there was a positive relationship between extrinsic motivation and self-efficacy (Zhang et al., 2019; Ommering et al., 2019). Although this result was not in the expected direction, it indicated that participants with higher scores on extrinsic motivation were more likely to be miscalibrated than calibrated.

This result may be explained by Ryan and Connell's (1989) concept of controlled regulation, which suggests that students who are extrinsically motivated often feel pressured or controlled by the incentive to obtain extrinsic rewards, such as high grades (Conti, 2000). In turn, unpleasant emotions accompany controlled regulation such as stress or uncertainty, which may undermine self-efficacy (Hernández, González, González & Barcelata, 2019). Students with high scores on extrinsic motivation may have therefore experienced greater uncertainty about their capabilities, thus they were more likely to be underconfident than overconfident.

By contrast, the hypothesis that participants with higher scores on a measure of intrinsic motivation were more likely to be calibrated was supported. Students with high scores on intrinsic motivation were more likely to be calibrated than overconfident. This result was consistent with literature that has indicated intrinsic

motivation is associated with better self-regulatory behaviour which, in turn, allows students to accurately monitor and evaluate their competencies (Turner et al., 2009; Millward, Rubie-Davies & Wardman, 2018). In the present study, the appropriate self-regulation that accompanies higher intrinsic motivation may have therefore facilitated better calibration accuracy.

Task Value

The hypothesis that students with high scores on a measure of task value were more likely to be overconfident was not supported. While task value was a significant predictor in the model, contrary to expectations, results in the present study suggested that students who perceived their psychology coursework to be valuable and useful were more likely to be underconfident. This finding was inconsistent with previous research that indicated greater interest and perceived value of academic tasks were associated with overconfidence (Gonida & Leondari, 2011; Sheldrake et al., 2016). However, the results in the present study indicated that participants were prone to miscalibration nonetheless.

This result was consistent with research by Ertmer et al. (2011) that indicated undergraduate students in an introductory course indicated low expectancies to succeed at novel tasks, despite understanding their value in other learning contexts. Given the participants in the present study were undergraduates in their first semester of university study, uncertainty about how to approach course work may have led them to believe they were incapable, despite valuing the coursework itself.

Perfectionistic self-presentation

The hypothesis that participants with higher scores on a measure perfectionistic self-presentation would be more likely to be underconfident was supported. Participants with high scores on perfectionistic self-presentation were

more likely to be underconfident than calibrated. This result was consistent with research that has indicated that perfectionistic self-presentation is associated with low confidence and low self-efficacy (Frost & Henderson, 1991; Hart et al., 1997).

A potential explanation for this result is offered by research that suggests perfectionistic presentation is accompanied by pressure to conceal negative aspects of the self to others (Hewitt et al., 2003). In the present study, excessive pressure to appear perfect to other students and staff, and to conceal potentially negative aspects of the self, such as academic incompetency, may have therefore led studies with higher perfectionistic self-presentation scores to be more likely to be underconfident.

Sex

Contrary to expectations, sex was not identified as a significant predictor and was not included in the final model because it did not significantly differentiate between underconfident, overconfident, and calibrated students. While sex has been associated with overconfidence insofar as males have a tendency to overestimate their grades, meta analyses have only identified small effect sizes (Hyde, Fennema, Ryan, Frost & Hopp, 1990; Huang, 2013). Other meta-analyses have found no such effects (Hansford & Hattie, 1982; Valentine et al., 2004).

Additionally, the majority of literature that has identified this effect has examined maths self-efficacy (Huang, 2013; Sheldrake et al., 2014), which may not be applicable to psychology specific self-efficacy beliefs. However, the small sample size in this study may have had insufficient power to detect a true effect, which is explored in greater detail in the limitations section below.

Limitations

Although a multiple imputation was conducted to manage missing data for ATAR scores, multiple imputation is designed to function best when data is missing

completely at random, which means that there are no systematic differences between the missing values and the observed values (Sterne et al., 2019). Problematically, the analysis in the present study contained data that was not missing completely at random (Little's MCAR test $p>.05$) and it is likely that they were missing not at random. This meant that even after the observed data were taken into account, systematic differences are likely to have remained between the participants who did not have an ATAR score (Sterne et al., 2009). In the present study, participants who provided an ATAR score were likely to differ from those for whom this value was missing (which may have included, for example, mature aged students, international students, or students who did not know or did not want to report their ATAR). This being the case, bias may have been introduced into the current model, by only including scores from participants with similar characteristics (who may have been predominantly high achievers). Despite this limitation however, alternative options for missing data were unsuitable, such as deleting cases list-wise. Although deleting cases list wise is easy to implement, it has been deemed one of the "worst" methods to deal with missing data because it substantially reduces power and introduces extreme biases for data that is missing not at random (Myers, 2010).

Sample size guidelines for multinomial logistic regression recommend that 10 participants per predictor variable are necessary to detect a genuine effect (Hosmer & Lemeshow, 2000). In the present study, data collection was only possible over a two-week period before students had received formal feedback on their assessments, during which time only 86 complete surveys were collected, despite having ten predictor variables. The present sample size may therefore have been unable to detect effects or differentiate between students who were underconfident and overconfident. As such, the present results need to be interpreted with caution.

The present study also comprised a specific sample of undergraduate students in their first semester of their psychology studies. As such, the results of the current study cannot be generalised to populations beyond this sample, including students from other courses, different year levels, or to individuals outside of university contexts. To enhance generalisability, future studies that examine the characteristics behind miscalibrated academic self-efficacy would benefit from examining students from other year levels, including, for example, fourth year honours students who are faced with complex academic requirements that may be influenced by different levels of self-efficacy (Foulstone & Kelly, 2019).

As with all correlational/cross-sectional designs (Altman & Krywinski, 2015), the present research cannot make any causative conclusions about the impact of cognitive, motivational, or attributional characteristics, or previous experience on calibration accuracy.

Implications for the field of educational psychology

Given the statistical and methodological limitations that restrict the extent to which reliable conclusions can be drawn from the present study, subsequent implications must be approached with caution. However, if the current findings were to be replicated in future research comprising an adequate sample size and representative sample (for example, including students from a range of faculties across various universities), the results would have important implications for informing educators how to target and realign miscalibrated self-efficacy.

If the result that students who had completed a pre-tertiary psychology unit were more likely to be underconfident is replicated in future research with fewer methodological and statistical confounds, this would have implications for or pathway planning university orientation programs in pre-tertiary settings. In these

programs, it may be useful for educators to draw explicit comparisons between pre-tertiary units and first-year university curricula to reduce uncertainties about perceived difficulties that may have contributed to under-confidence (Brinkworth et al., 2009; Prat-Sala & Redford, 2010). More specifically, Crisp et al. (2009) have suggested providing students with a survey during orientation that examines expectations about university may help students and educators identify beliefs that misalign with university standards which, in turn, allow them to explicitly target and make efforts to realign under-confidence.

Drawing on the finding that students with higher internal attributions of success were more likely to be overconfident, should this finding be replicated in future studies with adequate power, it may inform strategies that improve self-insight and reduce bias in first year students (Ehrlinger et al., 2016). For example, assignment feedback could be tailored to emphasise constructive criticism rather than the positive elements of students' work to divert attentional biases and direct students to acknowledge their skill deficits. However, the usefulness of this approach may be limited if students externalise failure to sources such as harsh judgement or bad luck to preserve their self-esteem (Bol et al., 2005). In order to avoid this, framing feedback as a product of students' performance rather than their self-worth would be particularly useful (Nicol & Macfarlane-Dick, 2006).

The finding that students with higher ATARs were more likely to be overconfident may necessitate the integration of programs into first year undergraduate studies that help students improve insight (Händel & Dresel, 2018). If this result is replicated in future studies with adequate power, de Bruin et al.'s (2017) monitoring and regulation online learning tool could be integrated into first-year undergraduate programs. This tool encourages students to monitor their learning by

judging their accuracy, testing themselves, then integrating feedback that explicitly states whether they were over or underconfident. This may help realign students' confidence with their actual capabilities, thus targeting their poor insight.

Monitoring and regulation programs may also be useful for students with high task value scores, by allowing them to reconsider and readjust their beliefs to avoid under-confidence due to the potential anxiety or stress that may be associated with tasks that students value or perceive to be important. This would be particularly useful for students commencing degrees that they anticipate a career in, such as students commencing undergraduate psychology degrees who anticipate a career as a psychologist, for whom tasks will be perceived as especially valuable.

Considering the result that participants with high scores on perfectionistic presentation were also more likely to be underconfident, monitoring and regulation programs may also be useful for helping students identify discrepancies between their own standard of "failure" and actual academic outcomes. In particular, this could deliver messages about the difference between striving for excellence rather than the display of perfection, as well as explaining the downsides of perfectionism, such that it may hurt, rather than help, performance (Flett & Hewitt, 2014).

Drawing on the finding that students with higher scores on extrinsic motivation were more likely to be underconfident, teachers or lecturers in university contexts may benefit from shifting the emphasis on performance away from extrinsic goal properties, such as grade points or achievement awards (Ryan & Deci, 2000). Alternatively, it may be more constructive for teaches to emphasise the enjoyable qualities of tasks to enhance intrinsic motivation, which was associated with a higher likelihood of calibration accuracy in the present study, and appropriate self-regulatory behaviour in existing research (Maralani, 2016; Turner et al., 2009).

Future directions

There is tremendous scope for future research beyond the present study. Given the magnitude of the effect that students who had completed a pre-tertiary psychology unit were more likely to be underconfident, exploring this further with a larger sample may yield particularly powerful results. Further exploration of the influence of pre-tertiary psychology is particularly important to inform pathway planning and university orientation programs that have the potential to improve calibration accuracy, self-regulatory behaviour and subsequent achievement.

The present study only measured global self-efficacy on one occasion early in students' first semester in their first year of study. As such, inferences about the stability of academic self-efficacy, or how it develops in higher education cannot be deduced from these results (Ferla et al., 2010). Future research would therefore benefit from examining self-efficacy with longitudinal designs that track how self-efficacy evolves across an undergraduate university degree. Such research would also benefit from examining self-efficacy at various levels of specificity; for example, examining self-efficacy at narrower tasks levels, or in broader courses. This research would be particularly valuable for tailoring interventions to realign miscalibration at specific educational levels, and for specific tasks (such as exams).

Exploration of characteristics beyond the predictors in the present study will also be worthwhile. In particular, it may be valuable to explore the impostor phenomenon. As this phenomenon is characterised by feelings of fraudulence, self-doubt and devaluation of achievements despite a clear history of academic success (Blondeau & Awad, 2018; Hutchins & Rainbolt, 2017), it may be a potential predictor of under-confidence in future research. In terms of overconfidence, it may be worthwhile examining personality traits such as subclinical narcissism. As this

trait is characterised by grandiosity, entitlement, and superiority (Robins & Beer, 2001), it may be a strong predictor of under-confidence.

If the results in the present study are replicated, they may cast doubt on the social cognitive assumption that self-efficacy predicts performance in a simple linear fashion (Bandura, 1997). The present study has indicated that overall, students were prone to miscalibration. Given that research on the characteristics that influence miscalibration have only recently begun to be investigated and the results in the present study are impacted by statistical and methodological limitations, these interpretations are speculative and await further replication.

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Appendices

Appendix A: Online information sheet and consent form, demographic questions

Appendix B: Online survey scale questions

Appendix C: Ethics approval letter

Appendix A: Online information sheet and consent form, demographic questions

Invitation

We would be grateful for your participation in this study about academic beliefs, which is being conducted by Honours student investigator under the supervision of Dr Kate Talsma.

What is the purpose of this study?

The aim of this study is to explore how students' academic behaviours and outcomes are affected by their academic beliefs, along with other student characteristics (like personality, age, and self-esteem) and other experiences of the student (like previous studies).

How is this study being funded?

No external funding has been received for this study. The study is being conducted as part of a University of Tasmania Honours project.

Why have I been invited to participate?

First-year psychology students at all campuses of the University of Tasmania are invited to participate in the study.

What will I be asked to do?

You will be asked to complete an online questionnaire, which is expected to take 30 minutes. The questionnaire will begin with demographic questions like your age and nationality. Most of the remaining survey items consist of statements about how you

behave or what you believe or feel in a range of different contexts. You answer by clicking on the option which shows how much you agree or disagree with the statement given. In some cases, you will be invited to answer freely by typing next to the field provided. We are also asking for your permission to access your first-year psychology assessment results and store these anonymously with your survey responses. If you agree to participate, by submitting the questionnaire, your psychology assessment results will be added to the data file of survey responses by the Chief Investigator after they have been released to students. Once the data is collated, only a unique code will be used to identify individuals' information; there will be no information in the data file which identifies you personally (e.g., your student ID). One file which contains only your student ID and your project code will be kept separately in case you decide you want to withdraw from the study at a later time. Only the chief investigator will have access to the file, which will be stored on a password-protected cloud server. We would be very grateful for your involvement, but participation is voluntary and there are no consequences if you decide not to participate. If you do not wish to have your first-year psychology results collated with your survey data then please do not provide your consent to participate. You may simply close the survey window.

Are there any benefits from participating in this study?

As a first-year psychology student, you will receive 60 minutes (1 unit) of research participation credit for participating. Students who are not eligible for research participation credit, or those who are eligible but do not wish to receive research participation credit, may enter a draw to win one of 6 $50 gift cards. You indicate your preference in the final question of the survey. More generally, a better

understanding of students' academic self-beliefs may benefit university students and teachers, as well as psychology researchers.

Are there any possible risks from participation in this study?

There are no forseeable risks associated with participation in this study.

What if I change my mind during or after the study?

You are free to withdraw from the study at any time, without explanation, by simply not submitting the online survey. If you do submit the survey and later decide to withdraw from the study, the investigators will use the separate master file containing your student number and your project code (see point 5) to locate your record and remove it from the data file.

What will happen to the information when this study is over?

Your responses will be kept in a secure electronic location for a period of five years after publication of the data. Only the investigators will have access to the data during this time, after which, it will be destroyed.

How will the results of the study be published?

This research is related to the student investigator's Honours project and will form part of the Honours thesis. The research may also be submitted for publication in scholarly journals. If you are interested in finding out the results of the study, group-level results will be reported on the School of Psychology website. You will not be identifiable in the thesis, on the psychology website, or any subsequent publication relating to this data.

What if I have questions about this study?

If you have questions about this study you may contact the chief investigator, Dr Kate Talsma (kate.talsma@utas.edu.au). This study has been approved by the Tasmania Health and Medical/Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, you can contact the Executive OFficer of the HREC (Tasmania) Network on (03) 6226 6254 or email ss.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote H0017955. You are encouraged to print this page for your records.

How can I agree to be involved?

You can provide your consent to participate by clicking on the "submit" button at the end of the survey. This will be the final page of the survey that you see. If you do not wish to participate, you may simply close the survey window without submitting the questionnaire.

Informed consent

Thank you for your participation in this study. Please indicate whether you would like to go in a draw to win one of 6 x $50 e-gift vouchers OR receive research participation (SONA) credit. By clicking “submit” below, you provide your consent to participate in this study in accordance with the information sheet you read on the first page of the questionnaire.

Appendix B: Online survey questions

Demographic questions:

1. What is your UTAS student ID?
2. What is your age?
3. What is your sex?
4. What is your nationality?

Educational background questions:

1. What is your ATAR, if you have one?

Grade aim:

1. What academic grade are you striving for in your psychology unit? *Please click and drag the slider handles to enter your answer (from 0 to 100).*

Psychology specific self-efficacy questions:

How confident are you that you can achieve the academic outcomes listed below?

If you are confident in your ability to achieve the outcome, select yes.

If you are not confident in your ability to achieve the outcome, select no.

1. I am confident in my ability to achieve a grade of at least 40% in this unit
2. I am confident in my ability to achieve a grade of at least 45% in this unit
3. I am confident in my ability to achieve a grade of at least 50% in this unit
4. I am confident in my ability to achieve a grade of at least 55% in this unit
5. I am confident in my ability to achieve a grade of at least 60% in this unit
6. I am confident in my ability to achieve a grade of at least 65% in this unit
7. I am confident in my ability to achieve a grade of at least 70% in this unit

8. I am confident in my ability to achieve a grade of at least 75% in this unit
9. I am confident in my ability to achieve a grade of at least 80% in this unit
10. I am confident in my ability to achieve a grade of at least 85% in this unit
11. I am confident in my ability to achieve a grade of at least 90% in this unit

Self-Enhancement and Self-Protection Scale

Positivity Embracement (internal attribution of success)

1. When you achieve successes or really good grades, thinking it was due to your ability.
2. When you achieve successes or really good grades, thinking it says a lot about you as a person.
3. When you achieve successes or really good grades, playing up the importance of that ability or area of life.

Defensiveness (external attribution of failure)

1. When you do poorly at something or get bad grades, thinking it was due to bad luck.
2. When you do poorly at something or get bad grades, thinking that the situation or test was uninformative or inaccurate (e.g., thinking the exam was badly designed, or thinking "that can't be right").
3. When you do poorly at something or get bad grades, thinking hard about the situation and feedback until you find something wrong with it and can discount it.

Motivated Strategies for Learning Questionnaire

Intrinsic Motivation:

1 (not at all true of me) – 2 – 3 – 4 – 5 – 6 – 7 (very true of me)

1. In a class like this, I prefer course material that really challenges me so I can learn new things.
2. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
3. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
4. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

Extrinsic Motivation:

1 (not at all true of me) – 2 – 3 – 4 – 5 – 6 – 7 (very true of me)

1. Getting a good grade in this class is the most satisfying thing for me right now.
2. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
3. If I can, I want to get better grades in this class than most of the other students.
4. I want to do well in this class because it is important to show my ability to my family, friends, employer or others.

Task Value

1 (not at all true of me) – 2 – 3 – 4 – 5 – 6 – 7 (very true of me)

1. I think I will be able to use what I learn in this course in other courses.
2. It is important for me to learn the course material in this class.
3. I am very interested in the content area of this course.
4. I think the course material in this class is useful for me to learn.
5. I like the subject matter of this course.
6. Understanding the subject matter of this course is very important to me.

Perfectionistic Self-Presentation Scale

1 (disagree strongly) – 2 – 3 – 4 (neutral) – 5 – 6 – 7 (agree)

1. It is okay to show others that I am not perfect.
2. I judge myself based on the mistakes I make in front of other people.
3. I will do almost anything to cover up a mistake.
4. Errors are much worse if they are made in public rather than in private.
5. I try always to present a picture of perfection.
6. It would be awful if I made a fool of myself in front of others.
7. If I seem perfect, others will see me more positively.
8. I brood over mistakes that I have made in front of others.
9. I never let others know how hard I work on things.
10. I would like to appear more competent than I really am.
11. It doesn’t matter if there is a flaw in my looks.
12. I do not want people to see me do something unless I am very good at it.
13. I should always keep my problems to myself.
14. I should solve my own problems rather than admit them to others.
15. I must appear to be in control of my actions at all times.

16. It is okay to admit mistakes to others.

17. It is important to act perfectly in all social situations.

18. I don’t really care about being perfectly groomed.

19. Admitting failure to others is the worst possible thing.

20. I hate to make errors in public.

21. I try to keep my faults to myself.

22. I do not care about making mistakes in public.

23. I need to be seen as perfectly capable in everything I do.

24. Failing at something is awful if other people know about it.

25. It is very important that I always appear to be “on top of things”.

26. I must always appear to be perfect.

27. I strive to look perfect to others.

Appendix C: Ethics approval letter

UNIVERSITY of TASMANIA

08 April 2019

Ms Kate Talsma
C/- University of Tasmania

Sent via email

Dear Ms Talsma

REF NO: H0017955
TITLE: Academic self-efficacy: sources and miscalibration

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 05 April 2019.

Please ensure that all investigators involved with this project have cited the approved versions of the documents listed within this letter and use only these versions in conducting this research project.

This approval constitutes ethical clearance by the Tasmania Social Sciences HREC. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approvals of other bodies or authorities are required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

In accordance with the National Statement on Ethical Conduct in Human Research, it is the responsibility of institutions and researchers to be aware of both general and specific legal requirements, wherever relevant. If researchers are uncertain they should seek legal advice to confirm that their proposed research is in compliant with the relevant laws. University of Tasmania researchers may seek legal advice from Legal Services at the University.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Human Research* (NHMRC 2007 updated 2018).

Therefore, the Chief Investigator's responsibility is to ensure that:

(1) All investigators are aware of the terms of approval, and that the research is conducted in compliance with the HREC approved protocol or project description.

(2) Modifications to the protocol do not proceed until **approval** is obtained in writing from the HREC. This includes, but is not limited to, amendments that:
(i) are proposed or undertaken in order to eliminate immediate risks to participants;

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(ii) may increase the risks to participants;
(iii) significantly affect the conduct of the research; or
(iv) involve changes to investigator involvement with the project.

Please note that all requests for changes to approved documents must include a version number and date when submitted for review by the HREC.

(3) Reports are provided to the HREC on the progress of the research and any safety reports or monitoring requirements as indicated in NHMRC guidance. Researchers should notify the HREC immediately of any serious or unexpected adverse effects on participants.

(4) The HREC is informed as soon as possible of any new safety information, from other published or unpublished research, that may have an impact on the continued ethical acceptability of the research or that may indicate the need for modification of the project.

(5) All research participants must be provided with the current Participant Information Sheet and Consent Form, unless otherwise approved by the Committee.

(6) This study has approval for four years contingent upon annual review. A *Progress Report* is to be provided on the anniversary date of your approval. Your first report is due 05 April 2020, and you will be sent a courtesy reminder closer to this due date. Ethical approval for this project will lapse if a Progress Report is not submitted in the time frame provided

(7) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of the project.

(8) The HREC is advised of any complaints received or ethical issues that arise during the course of the project.

(9) The HREC is advised promptly of the emergence of circumstances where a court, law enforcement agency or regulator seeks to compel the release of findings or results. Researchers must develop a strategy for addressing this and seek advice from the HREC.

Should you have any queries please do not hesitate to contact me on (03) 6226 6254 or via email ss.ethics@utas.edu.au.

Yours sincerely

Jude Vienna-Hallam
Executive Officer I Social Sciences

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